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Construction, Performance, and Installation Standards for Gas-Burning Appliances

by

R. M. Conner,[1] *Director*
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Flexible tubing, restaurant ranges, private garage heaters, clothes dryers, incinerators, ironers, and conversion burners

Due to the magnitude of our national industrial development and the complexity of present-day civilization, standardization in one form or another has come to be considered an indispensable factor. Its value in various branches of industry has long been recognized, but until recent years to consumers it was something to be taken for granted. The introduction of home economics and home management courses in colleges, universities, and other educational institutions, coupled with the activities of women's clubs and home economics organizations, however, has resulted in more intelligent buying on the part of the public, and the taking of active steps toward the standardization of goods from the customers' point of view.

The development of standards of a national character requires technical skill and experienced judgment relating to the engineering, production, and merchandising phases of the object or objects to be standardized, and correlation of all existing methods and processes, together with adequate recognition of many interests, including producers, consumers, and independent groups and organizations, directly or indirectly affected.

Trade associations and engineering societies, on account of the adaptability of their set-ups for work of this nature, have served effectively in the development of standards in their respective fields. Outstanding examples of standards drafted by such groups are the codes developed by the American Society for Testing Materials, the American Society of Mechanical Engineers, and the American Gas Association. A careful study of all such codes will, however, reveal some overlapping, duplication of effort, and in some cases inconsistencies. A national standardization body such as the American Standards Association, through which all such codes may be cleared and be given the status of American Standards, serves to avoid such factors as overlapping, inconsistencies, and duplication, and at the same time brings about recognition of the viewpoints of additional interests which may not have been considered by the original sponsor of the code.

For a number of years the American Gas Association has been actively engaged in the development of standards for the approval and installation of various types of gas-burning appliances. Steps were taken to prepare standards for gas ranges as early as 1903. In 1919, the American Gas Institute and the National Commercial Gas Association were consolidated and became known as the American Gas Association. Shortly thereafter, active work was started toward the correlation of existing codes relating to the gas business and the development of standards of a national character. A further step toward standardization was taken in 1926 when the Natural Gas Association of America combined with the American Gas Association. In 1927, the Gas Safety Code was completed and approved as American Standard (K2-1927) by the American Standards Association.

Between the years 1925 and 1930, American Gas Association approval standards were prepared for flexible gas tubing, gas ranges, space heaters, gas water heaters, gas boilers, furnaces, unit heaters, clothes dryers, and incinerators. Installation requirements for house piping and appliance installation were also developed. In September, 1930, the A.G.A. Approval Requirements Committee was reorganized as a sectional committee (Z21) of the American Standards Association, and early in 1932 the A.G.A. Approval Requirements for Gas Ranges were approved by the American Standards Association as American Recommended Practice. Between 1930 and 1932, approval requirements for gas-heated ironers, hotel and restaurant ranges, and private garage heaters, and installation requirements for conversion burners in house-heating and water-heating appliances, were prepared. During this same interval revisions were effected in many of the existing requirements for other types of appliances.

In 1932, the requirements listed below were com-

[1] Secretary, Sectional Committee on Approval and Installation Requirements for Gas-Burning Appliances (Z21).
[2] Cleveland, Ohio.

pleted by the Sectional Committee on A.G.A. Approval Requirements (Z21), approved by the sponsor, the American Gas Association, and as American Standards by the American Standards Association:

American Standard A.G.A. Approval Requirements for Flexible Gas Tubing (Z21.2-1932)
American Standard A.G.A. Approval Requirements for Hotel and Restaurant Ranges (Z21.3-1932)
American Standard A.G.A. Approval Requirements for Private Garage Heaters (Z21.4-1932)
American Standard A.G.A. Approval Requirements for Clothes Dryers (Z21.5-1932)
American Standard A.G.A. Approval Requirements for Incinerators (Z21.6-1932)
American Standard A.G.A. Approval Requirements for Gas-Heated Ironers (Z21.7-1932)
American Standard A.G.A. Approval Requirements for Installation of Conversion Burners in House Heating and Water Heating Appliances (Z21.8-1932)

A brief discussion of each of these standards will be given in the following pages.

Flexible gas tubing

The first standards for flexible gas tubing were prepared jointly by committees of the National Commercial Gas Association and the American Gas Institute in 1916. In 1919, the National Bureau of Standards issued a bulletin on "Tests of Flexible Gas Tubing" with "Modified Specifications Proposed." Standard Performance Specifications for Flexible Gas Tubing were recommended by the A.G.A. Committee on Standardization of Gas Appliance Specifications in 1921. These specifications were reviewed by the A.G.A. Approval Requirements Committee in 1926 and certain revisions in them were effected, after which they were published and distributed under the title of "A.G.A. Approval Requirements for Flexible Gas Tubing." In 1932 these requirements, as revised by the subcommittee, were approved by the Sectional Committee on A.G.A. Approval Requirements (Z21) and subsequently by the American Standards Association.

Flexible gas tubing is extensively used, especially in warmer climates, for connecting gas appliances to house piping. Where it is desirable to remove space heaters, for example, in the spring, and store them during the summer season, it is much more convenient to use flexible gas tubing than it is to use solid piping. It is also desirable, in some cases, to move portable gas heaters from one room to another. This is readily possible by having the appliance connected with flexible gas tubing, whereas the temporary changing of positions of the heater is not conveniently accomplished if solid connections are used. In many cases it is desirable to use portable connections for hot plates. Connections of this kind are permissible on one-burner hot plates where no gas cock or shut-off valve is provided on the appliance. Likewise, space heaters and gas-heated ironers when attached to the gas supply by means of tubing must not be provided with means for shutting off the gas supply at the appliance, but in all cases, in order to shut off the appliance, it should be necessary to turn the gas off at the house piping at the point where it connects with the tubing. This prevents the existence of gas pressure on the tubing when the appliance is not operating, and avoids the possibility of leakage of raw gas in case the tubing should become disconnected.

The American Standard A.G.A. Approval Requirements for Flexible Gas Tubing include specifications and test methods for leakage, capacity, strength, flexibility, resistance to freezing and to heat, and elasticity and gripping power of rubber slip ends. In fact, every known factor which might affect the safety and performance of flexible gas tubing in service was taken into consideration in the drafting of these standards.

Restaurant ranges

The standards for hotel and restaurant ranges, referred to above, are the first that have ever been prepared for general distribution on appliances of this type. They were initially drafted by the Subcommittee on A.G.A. Approval Requirements for Hotel and Restaurant Range, of the sectional committee. In December, 1931, the tentative requirements were completed, approved by the sectional committee, and distributed for criticism. In 1932, they were reviewed by both the subcommittee and the sectional committee, approved by the sponsor, and subsequently by the American Standards Association.

For convenience, these standards are divided into two parts; namely, Part I, Construction Requirements, and Part II, Performance Requirements. In the drafting of these requirements sight was not lost of the necessity of providing every opportunity for manufacturers to improve their products and to embody individuality in their design and construction. Although these requirements are designed to be minimum standards they are yet sufficiently detailed and rigid to insure safety, reasonably rigid and durable construction, as well as a comparatively high operating efficiency when the appliances are properly installed and adjusted on city gas.

The construction requirements embody minimum specifications for every part of the appliance, including burners, gas cocks, lighters, thermostats, pilots, weights of materials, etc.

The performance standards cover such features as combustion over a wide range of gas pressures on the three types of test gases specified, fire hazard, oven heating capacity, oven and broiler heat distribution, performance of oven thermostats, gas cocks, devices to prevent the escape of unburned gas, automatic lighters, etc. They also include requirements and test methods designed to insure strength and rigidity of tops, frames, and bases, protection from possibilities of explosion, as well as resistance to corrosion of oven linings and other parts subjected to corrosive action in service.

Test gas	*Heating value (Btu/cu ft)*	*Specific gravity (Air = 1.0)*	*Normal test pressure (In. H_2O)*
Natural gas	1135	0.65	7
Coke oven gas.....	535	0.38	3.5
Carburetted water gas.	400	0.70	3.5

TABLE 1

Gases and normal pressures employed in tests for approval

All of the standards listed above, with the exception of those for flexible gas tubing and conversion burners, require that appliances be tested for combustion on three distinctly different types of city gases at gas pressures ranging from 50 per cent below normal to 25 and 50 per cent above normal. The test gases used and the normal pressures specified are listed in Table 1.

The operating characteristics of these gases are representative of all the various city gases distributed throughout the United States and Canada. The normal gas pressures specified also represent the average distribution pressures for natural and manufactured gases. To insure that appliances will have sufficient flexibility of performance to accommodate reasonable gas-pressure fluctuations, the combustion and many other tests are conducted over the range of pressures indicated above.

Private garage heaters

Preparation of the standards for private garage heaters was undertaken late in 1930 by the Subcommittee on A.G.A. Approval Requirements for Garage Heaters of the sectional committee. Prior to that time, two codes relating to the construction, performance, and installation of garage heaters had been prepared, one by the Underwriter's Laboratories in 1917, and the other, relating largely to installation, by the National Fire Protection Association. Both of these codes were carefully studied in the drafting of the A.G.A. Approval Requirements for Private Garage Heaters. Notwithstanding this fact, however, the development of the A.G.A. Approval Requirements for Garage Heaters required the conduct of extensive research, relating to various features of safety and performance.

The tentative requirements for private garage heaters were completed by the subcommittee and the sectional committee in December, 1931, and released to the industry for criticism. After review of the criticisms by both committees, the final requirements were completed, approved by the sponsor, and by the American Standards Association in 1932.

The general arrangement and context of the requirements for garage heaters are similar to those for hotel and restaurant ranges. Differences in the design and construction of the two types of appliances and the distinctly different services they are designed to render naturally necessitate many variations between the requirements and tests applied in each case. Two sections under the construction requirements, for example, are peculiar to garage heaters. These are "Section 7, Ignition" and "Section 13, Safety Guards and Screens." Clause b of Section 7 reads:

> "Construction of the heater shall be such that it will be impossible to gain access to the combustion chamber without first shutting off the gas supply to the main burner or burners of the heater."

Section 13 reads as follows:

> "a. Safety screens shall be accessible for cleaning.
>
> "b. Means shall be provided to prevent condensation from reaching safety guards or screens through which air for combustion enters.
>
> "c. Screens for air inlet openings shall be mechanically secured in place without the use of solder. Perforated sheets should be used in this connection and the sheets should measure not less than 0.025 inch in thickness and the openings should not be larger than 0.027 inch and should aggregate 400 per square inch."

The performance requirements are made with the same test gases as are specified for other types of gas appliances. (*See Table 1.*)

A peculiarity of the performance requirements for private garage heaters is the additional combustion test in a 1,000-cubic-foot air-tight room. In this test the heater is adjusted at normal gas pressure to

within 5 per cent of the manufacturer's hourly gas input rating. Air shutters, controlling the primary air to the burner, are regulated to give good flames, which adjustment is not changed during the series of tests with the adjustment gas. The heater is then placed in a completely ventilated 1,000-cubic-foot room. The gas is ignited and after a period of at least 15 minutes the door to the room is closed and sealed, all ventilation stopped, and the appliance is operated at one given test pressure for a period sufficient to consume 20,000 Btu of gas. This operation is repeated at normal gas pressure, 50 per cent below, and 50 per cent above normal pressure, without compensating adjustments, on both manufactured and natural gases. An automatic carbon monoxide recorder, accurate to approximately 2 parts in 100,000, is connected to the air-tight room and gives a continuous record of any carbon monoxide formed. The requirements specify that the heater must produce no carbon monoxide either during these tests or during the open room tests.

To insure safety from the hazard of fire (1) the warm-air discharge from a heater is limited to 160 degrees F, and (2) the design and performance of the heater is required to be such that the maximum temperature at a point 3 inches from the back and sides will not exceed 90 degrees F above room temperature.

Some of the safety provisions made against the possibilities of explosion include: (1) a requirement that "Burner flames shall be so guarded as to prevent ignition of an explosive mixture of natural gas and air or gasoline vapor and air entirely surrounding the heater"; (2) a specification making it mandatory that all flue gases be carried out the flue outlet of the heater; (3) requirements that flames from each burner shall ignite the gas at adjacent burners when the heater is operated at 2 inches gas pressure, that the gas at the burner shall ignite freely from the constant-burning pilot, that pilot flames will ignite the gas at the main burners without delay, and when ignition is made in a normal manner the flames shall not flash outside of the heater; (4) a requirement specifying that "The construction of the heater shall be such that, should sufficient gas accumulate before ignition so as to cause an explosion, the explosive force will expend itself without impairing subsequent safe operation"; and (5) specifications that the gas supply system shall not leak gas.

Other equipment

The standards for clothes dryers, incinerators, and gas-heated ironers are similar in character to those for hotel and restaurant ranges and private garage heaters referred to above. Space will not permit an extensive discussion of them, but a few facts concerning their history of development may prove of interest.

The first specifications for clothes dryers to be published appear to be those contained in the "Gas Appliance Testing Code" issued by the Pacific Coast Gas Association in 1924. In 1927 the A.G.A. Approval Requirements Committee appointed a Subcommittee on A.G.A. Approval Requirements for Clothes Dryers. The development of standards by that group was undertaken in 1928 and after exhaustive study and extensive research on the construction and performance of dryers, the tentative requirements were completed, approved by the A.G.A. Approval Requirements Committee, and published for criticism in 1929. The requirements and criticisms were later reviewed by both committees, and the standards were approved and released for publication and distribution in August of 1929. The following year the committees again reviewed the requirements, made certain revisions, and again submitted them for criticism. During the same year, the A.G.A. Approval Requirements Committee was reorganized as a sectional committee (Z21), of the American Standards Association with the result that further action in relation to the requirements was carried out according to ASA procedure. In October, 1930, the revised requirements were completed and published in final form. The A.G.A. Approval Requirements for Clothes Dryers were reviewed by the sectional committee in 1932, and after approval by the committee and the sponsor, were submitted to, and approved by, the American Standards Association. It may be of interest to note that approval of clothes dryers under these standards is limited to those of the indirect type.

The A.G.A. Approval Requirements for Portable Incinerators published in 1929 appear to be the first standards ever published relating to the details of construction and performance of incinerators. The second edition of these requirements was published and distributed in 1931. The third edition of these requirements was prepared and approved as American Standard in 1932.

According to available records, the first requirements for gas-heated ironers to be published and distributed were those issued by the Pacific Coast Gas Association in 1924. In 1929 preparation of approval standards for appliances of this type were undertaken by the American Gas Association through a subcommittee of the A.G.A. Approval Requirements Committee. In 1930, the requirements were completed and published in final form. Progress in the utilization of gas and new developments in ironer construction indicated in 1932 the advisability of revising

these standards; consequently, they were reviewed by the subcommittee and the sectional committee in 1932, certain changes and revisions were effected in them, and after approval by these groups and by the sponsor, the American Gas Association, they were presented to the American Standards Association and approved as American Standard.

In recent years tremendous expansions have been made in the natural gas industry. Numerous new natural gas fields have been developed, production and distribution methods improved, and the long-distance transmission of natural gas has been made, not only economically feasible, but also a practical reality in numerous instances involving the use of thousands of miles of transmission lines. With the expansion in the use of natural gas there came a very marked increase in the demand for gas for house-heating purposes. This naturally led to increased activity in the manufacture and installation of gas conversion burners, since thousands of users of coal and other solid fuel, having house-heating boilers and furnaces which were still in serviceable condition, desired to convert their appliances to use gas rather than install gas-designed equipment. As a consequence, the desirability of having standard specifications for the installation of conversion burners soon became evident. In 1928, therefore, the A.G.A. Approval Requirements Committee appointed a subcommittee to prepare an installation code for the guidance of gas company fitters, heating and piping contractors, and conversion burner manufacturers, to insure the safe and efficient use of gas conversion burners in house-heating and water-heating appliances originally designed for the utilization of other types of fuel. The tentative requirements as drafted by the subcommittee were approved by the sectional committee in 1931 and subsequently printed and distributed for criticism. After the usual period of criticism had elapsed, the requirements were again reviewed and approved by both committees. They were approved as American Standard in January, 1933.

Symposium on Purchase of Paints

A valuable symposium on the purchase of paints is contained in the February, 1933, issue of *Pacific Purchasor*. The issue includes articles on purchasing paint for the public utility industry by Frank E. Baxter, assistant engineer of the Pacific Gas and Electric Company; and on purchasing paint for the oil industry by H. B. Truett, paint supervisor of the Associated Oil Company, San Francisco. There are also a number of brief articles by makers of different types of paints and related equipment. In his article on paints for the public utility industry, Mr. Baxter urges the extensive use of standardization and testing. He says:

> "Purchasing agents will likely agree that the selection and purchase of paint is, at best, a rather bothersome problem. Such a situation is inherent with the material because the relative quality of two paints can be judged only after the most careful analysis and lengthy tests. It is only natural, therefore, that an effective procedure for the standardization and control of paint purchases must be somewhat elaborate; particularly when applied to utility corporations whose painting requirements are of the most complex and varied character. When it is considered, however, that the paint purchases of such companies, in normal times, will amount to from $50,000 to $100,000 per year and that a total yearly expenditure for painting between one-quarter and one-half million dollars is not exceptional, the economy of such a procedure can more readily be understood."

Copies of the issue may be purchased from the Purchasing Agents' Association of Northern California, 433 California Street, San Francisco. A copy is available for loan to Members of the American Standards Association through the ASA information service.

Members of ASA Committees Appointed for 1933

Members of the ASA Committees on Representation, Finance, Procedure, and Ways and Means have been appointed for the year 1933.

Bancroft Gherardi, vice president of the American Telephone and Telegraph Company, New York, and past president of the American Standards Association, is the new chairman of the ASA Committee on Finance, and has also been appointed to membership on the Ways and Means Committee. The other members of the Finance Committee, both newly appointed for 1933, are Cloyd M. Chapman, Consulting Engineer, New York, and John C. Parker, president, Brooklyn Edison Company, Brooklyn, N. Y.

Quincy Bent, Bethlehem Steel Company, Bethlehem, Pa., is also a new member of the Committee

on Ways and Means. The Ways and Means Committee as now organized is as follows:

F. E. Moskovics, Frederick H. Levy Company, New York, *chairman*.
L. A. Downs, president, Illinois Central Railroad, Chicago, Ill.
R. J. Sullivan, vice president, Travellers' Insurance Company, Hartford, Conn.
Quincy Bent, Bethlehem Steel Company, Bethlehem, Pa.
Bancroft Gherardi, vice president, American Telephone and Telegraph Company, New York.

The membership of the Committee on Representation consists of W. T. Rossell, vice president, Brooklyn and Queens Transit Corporation, Brooklyn, newly appointed chairman of the committee and H. L. Huber, American Telephone and Telegraph Company, New York, reappointed for 1933.

J. C. Irwin, valuation engineer, Boston and Albany Railroad, Boston, has been newly appointed to membership on the Committee on Procedure and Administrative Problems. Alexander Maxwell, National Electric Light Association, reappointed for 1933, is the new chairman of this committee. The other members, who have been reappointed for the coming year, are: F. M. Farmer, vice president, Electrical Testing Laboratories, New York; S. L. Nicholson, Westinghouse Electric and Manufacturing Company, New York; A. W. Whitney, National Bureau of Casualty and Surety Underwriters, New York.

Foreign Standards Available from ASA

New foreign standards available to Members of the American Standards Association for loan or purchase are listed below. They are available in the language of the country under which they are listed. In requesting copies of the standards it is necessary to list only the ASA serial numbers preceding the titles. Send either a post-card or a note containing only the name of the person wishing to receive the standards, and the numbers of the standards desired. The card or envelope should be addressed to the American Standards Association, 29 West 39th Street, New York.

Serial Number

Canada

343. Essential requirements and minimum standards covering electrical equipment, part two, Canadian electrical code
344. Established lists of machine screws and square and hexagon machine screw nuts
345. Cap screws, set screws and studs; common and semi-finished, slotted and castellated hexagon nuts

Great Britain

346. Extra-light tubular steel poles for telegraph and telephone purposes
347. Flame-proof type plug and socket, heavy duty, 100 ampere, for voltages not exceeding 600 volts
348. Mains-operated synchronous clocks
349. Manhole openings (size and position only) for chemical plant—fixed and mobile (not applicable for pressures over 175 lb per sq in.)

F. W. Peek on International Committee

The United States National Committee of the International Electrotechnical Commission has appointed F. W. Peek, Jr., chief engineer, Pittsfield Works, General Electric Company, Pittsfield, Massachusetts, as its representative on an international subcommittee of the Advisory Committees on Rating of Electrical Machinery and Standard Voltages and Codes. This subcommittee is to make a detailed study of the proposals which have been made by the various countries on the question of sphere-gap calibrations.

Handbooks on German Building Standards

Two handbooks each containing a collection of German national standards in the building field have been received from the German national standardizing body, and may be borrowed from the American Standards Association. The titles of the books, in translation, are *Technical Specifications for Building Construction,* and *Rules for Letting Building Contracts.* The books are published in German. The standards contained in these books are also published in form of loose sheets.

INDUSTRIAL STANDARDIZATION INDEX

The index to the 1932 issues of INDUSTRIAL STANDARDIZATION, Volume 3, which was published as Part 2 of the February, 1933, issue, was not included in a part of the mailing of the issue due to an error in the mailing office. Those who did not receive Part 2 should notify the American Standards Association so that copies of the index may be sent them.

Municipal Purchasing Methods—Milwaukee and New York

Savings of more than $600,000 were made last year by the City of Milwaukee through the centralization of its purchases and the extensive use of standard specifications, according to the Annual Report of the Milwaukee Purchasing Board and Department. Commenting on this report for INDUSTRIAL STANDARDIZATION, Russell Forbes, secretary of the National Municipal League, and associate professor of government in New York University, draws attention to the savings which New York City might make by adopting a system similar to Milwaukee's.

"A comparison and contrast between the purchasing system of Milwaukee and that of our country's greatest city," says Professor Forbes, "presents some interesting food for thought by the present generation of bankrupt taxpayers. One reason for the present favorable financial situation of Milwaukee has been the long-continued application of economic principles in its expenditures for supplies, materials, and equipment. Even though New York has lost many valuable years through failure to apply centralized purchasing locally, it is still not too late to adopt this method as a means for retrenchment in governmental costs. In 1932 the purchasing department of Milwaukee saved more than one dollar per capita through buying its matériel centrally, and through the application of the principles of standardization and written specifications. Through close team work with the accounting department, the purchasing agent of Milwaukee saved more on cash discounts in 1932 than the cost of operating the purchasing system.

"The recent report of Acting Mayor McKee's Committee on Purchasing estimated that the City of New York could save more than five million dollars per year by adopting only a part of the Milwaukee program of scientific buying. If all phases of the Milwaukee plan were applied to New York City's matériel problem, the savings would be much greater. This potential economy in New York and other cities should not be overlooked in this period of budgetary stress and strain."

The extensive use of specifications is one of the mainstays of Milwaukee's purchasing system. The list of specifications includes those of the Federal Government, the American Society for Testing Materials, the National Electric Light Association, and the American Water Works Association. Other specifications were prepared by the city laboratories in collaboration with the department heads and the purchasing board. Among the purchases covered by specifications are coal, bridge paint, fuel oil, sweeping compound, asphaltic road repair materials, road oil, sand, gravel, crushed stone, sewer pipe, gasoline, and lubricating oils.

All standard materials were tested before acceptance. Tests of gasoline and lubricating oils were made before delivery to the city tanks. By purchasing gasoline on specifications in quantities sufficient to meet the city's requirements for a period of six to seven months and purchasing other petroleum products in a similar manner, a saving for the year of over $50,000 was effected. The following advantages of centralized purchasing are listed in the report which was prepared by Joseph W. Nicholson, purchasing agent:

1. *Obtaining benefits of competition.* For example, by obtaining bids and entering into continuing agreements, the cost of ice delivered to the City Hall has been reduced from $10.00 to $5.20 per ton, and from $10.00 to $7.00 per ton on deliveries to the Police Stations in various parts of the city. Previously, ice had been purchased without bids.

2. *Purchasing in the proper quantities to obtain carload rates, etc.* For example, on April 15th bids were opened on 300 drums of calcium chloride for delivery at two different times. The lowest price received was $1.80 cwt, which was considered too high, and these bids were rejected. New bids were received, calling for 300 drums for delivery at one time. The lowest price received was $1.34 less 5 per cent, or $1.273 cwt net, a saving of $592.88 resulting from the taking of new bids on the basis of a single delivery.

3. *Standardization.* By reducing a great number of kinds of articles to a few, large savings were effected.

4. *Inspection of deliveries to insure the city's receiving what it is paying for.*

5. *Grouping of purchases, thereby reducing the unit cost through volume purchased.* This cuts the total number of orders issued and reduces the clerical and other office expense.

6. Centralization of purchases provides the means

for the preparation of specifications so that better material will be furnished and an accurate check can be made upon deliveries; reduction in sales expense, owing to the fact that salesmen call at one place instead of at many offices; savings effected by the central stores distribution of goods commonly used by all departments; purchase of materials, supplies, and equipment at the proper time, through the study of markets; proper negotiation for bids and open and aboveboard dealing with vendors, making one board and department responsible for all purchases, thereby centralizing all authority for purchasing; elimination of favoritism, resulting in getting a dollar in value for every dollar spent.

Purchasing in New York

In sharp contrast to the splendid functioning of the purchasing organization of Milwaukee are the present purchasing practices of the City of New York as revealed by former Acting Mayor McKee's Committee on Purchasing to which Professor Forbes referred above. Professor Forbes acted as the committee's consultant.

The following is a condensation of the illuminating section of the committee's report dealing with the standardization of commodity specifications:

At one time in its history, the City of New York had a greater record and reputation in the field of standardization than any other government in the United States. Between 1913 and 1918 the Bureau of Standardization had a competent staff engaged in the preparation of standard specifications for the purchase of commodities.

In that period more than 1600 standard specifications were prepared and were adopted for mandatory use by all branches of the city by the Board of Estimate and Apportionment. The specifications were carefully prepared after exhaustive research and study of existing commercial specifications, were subjected to careful analysis in the Central Testing Laboratory, and were agreed upon only after consultation with representatives of supplying concerns, and after a trial period of use in the city service. At that time the City of New York had a nationwide reputation in standardization and its specifications and standardization methods were highly respected and widely copied.

In 1918, after a change in the city administration, the Bureau of Standardization of Supplies and Equipment was abolished and its highly competent staff was disbanded. As a result of the abolition of the Bureau of Standardization, the city's specifications are, in many cases, now out of date and some of them have been unchanged during the past 12 or 13 years.

The different departments now sometimes buy the same commodity on different specifications calling for varying qualities. Such lack of standardization not only increases the difficulty of establishing centralized purchasing through pooling of requirements from several departments but also greatly increases the complexity of the task of inspection. No two of the 136 government agencies deriving their support wholly or in part from the annual budget use the same design or quality of letterhead. These are all purchased by the Board of City Record but evidently no control is exercised by the Board over the design or quality requisitioned.

It goes without saying that any system of purchasing, to be successful, must be reinforced with an accurate, simple, and thoroughgoing set of specifications accompanied by a rigid and consistent inspection system. If the purchasing system is deficient either in the specification of the quality required or in the insistence upon receipt of the quality called for in the specification, there is no accurate way of determining whether the city receives for use the exact article for which it pays.

Six different sets of specifications are used by the 28 departments or agencies of the city which reported that they purchase coal according to specifications. The New York Aquarium has no specification but reports that for 30 years it has purchased from one retail firm; coal for the Bronx Zoo is purchased on specifications, although both the Zoo and the Aquarium are parts of the same organization—the New York Zoological Society. Practically all of the coal used by the various departments is for heating buildings and obviously there is no need for the variations in specifications. Certainly the advantages of bulk purchasing cannot be attained when each departmental requirement must be contracted for on different terms.

The Committee's study points to the need for a thoroughgoing investigation of all the city's specifications. To determine what is in general the situation, the Committee collected from the Department of Purchase copies of all the standard specifications now in use, and from the other departments copies of their own specifications which are regularly used in the purchase of staple articles. Copies of all these specifications, approximately 1800 in number, were forwarded to the Bureau of Standards of the U. S. Department of Commerce where they have been classified and are being appraised by expert examiners at no cost to the City of New York. The conclusions of the Bureau of Standards' preliminary report are in part as follows:

"It is noted that the specifications, in general, are too indefinite as to description, grade, quality, and intended use of the commodities to be purchased, except for those which have been formulated within the past few years. Further, in not a few instances, several separate specifications have been found relating to a commodity which perhaps might well have been incorporated in a single comprehensive specification.

"Specifications for items included in the '25 group' of the New York City classification (materials for manufacture of prison goods) are not specifications in the real sense of the word. A general form of phraseology appears to have been used in writing up these specifications, with only the first few lines devoted to a definite description of the commodity. It would appear that such purchases are made on sample or trade-brand. Assuming this to be the case, there would be no particular need of specifications for the commodities covered by the '25 group.' In such cases, competition or the issuance of bids must necessarily be greatly restricted—even limited to only one or two manufacturers of the commodities intended for purchase.

"The 24 group, covering materials of construction (including lumber, timber, and building materials), was reviewed with a representative of the National Lumber Manufacturers Association. This entire group of lumber specifications, except for a certain few items, is now obsolete in so far as present purchasing practice is concerned. Most of the specifications covering lumber are dated 1914. Since that time the Central Committee on Lumber Standards, in cooperation with the industry and the U. S. Department of Commerce, established grading rules for softwood lumber known as American lumber standards. All softwood lumber, except in a few minor cases, is graded in accordance with American lumber standards grading rules."

The Committee believes that greater economy is possible in the purchasing system through the reestablishment of a staff for the formulation of new standard specifications and the revision of existing specifications. In other words, the Committee believes that the City of New York should start in again where it left off in 1918 when the Bureau of Standardization was abolished. The Committee believes that the importance of standardization of commodity specifications cannot be over-emphasized. The standardization of specifications should, it is believed, be a part of the work of the Department of Purchase but it should not be wholly under that department's control. Any effective logical standardization program must, of necessity, take into consideration the wishes and needs of the using departments of the government. No successful standardization program can be carried out without the expert assistance of the engineering forces of the city or the facilities of the testing laboratory.

In order, therefore, that all the technical services of the city should be enlisted in this task, and in order that the wishes and requirements of the using agencies should be respected, the Committee recommends that a Board of Standardization be set up with the following personnel representing the parties at interest:

The Commissioner of Purchase or his representative as chairman
An engineer from the Board of Estimate and Apportionment
An engineer from the Department of Finance, and
An engineer and chemist from the Department of Purchase.

This personnel should, of course, be supplemented by representatives from any other departments, boards, or commissions which are concerned with the particular specification under consideration. Such Board should be a regular and integral part of the structural organization of the city, and its powers and duties should be clearly defined by law.

The Board of Standardization should be required to bring up to date all existing standard specifications which have been adopted by the Board of Estimate and Apportionment and to prepare new specifications for commodities which are bought regularly, and used in common by two or more of the city and county departments.

Standardization of Terminology for Color Fastness Needed

"The textile industry certainly needs some standardization of the term 'dye-fast,'" says John Black in an article on color fastness in the November, 1932, issue of *Merchandise Manager*. Women have definitely become color conscious in their purchases of textiles, says Mr. Black, and they are insisting that colors hold their shade. He declares that the color situation for retailers as well as for producers has been aggravated by the use of cheaper and more fugitive colors as part of the tendency to cut prices at the expense of quality. Standardization of the terminology of color fastness, he believes, will help to improve the situation.

ASA PROJECTS

A Review of Civil Engineering Projects Under ASA Procedure

The fifth of a series of reviews of standardization projects under the procedure of the American Standards Association

The status of all civil engineering projects under ASA procedure, with the exception of the safety code projects, is summarized in the following review. The report of the safety code projects was published in the issue of November, 1932. The data presented in this review are taken from the files of the American Standards Association and are corrected to February 1, 1933, bringing up to date the review of civil engineering projects published in the issue of March, 1932.

A1—Specifications for Portland Cement

Sponsor—American Society for Testing Materials.

For this project two standards have been approved as follows: A1a-1930—Standard Specifications for Portland Cement (A.S.T.M. C 9-30) and A1b-1931—Standard Methods of Testing Cement (A.S.T.M. C 77-30). These were approved as revisions of an earlier single standard that contained both the specifications and the methods of testing.

During 1932 the A.S.T.M., in accord with recommendations of its Committee C-1 on Cement, adopted a revision of Standard Methods of Testing Cement (A.S.T.M. C 77-30). The title and designation of the new document is Standard Methods of Sampling and Testing Portland Cement (A.S.T.M. C 77-32). Approval of this revision as American Standard was recommended recently by the sectional committee, which considered the revised document by letter-ballot action. The recommendations of the sectional committee have been endorsed by the sponsor, and the question of its approval is now before Standards Council.

The necessity for this revision, indicated in 1930 when methods of testing were separated from specifications for Portland cement, was given consideration by the A.S.T.M. committee for two years, and the original document was completely rewritten in order to avoid ambiguous wordings in several sections.

In connection with the revision of the Standard Methods for Testing Cement, minor editorial changes to include tolerances for limits of chemical properties have been made in the text of American Standard Specifications for Portland Cement (A1a-1931) (A.S.T.M. C 9-30). These changes were noted on page 319, of INDUSTRIAL STANDARDIZATION, December, 1932.

A2-1926—Fire Tests of Building Construction and Materials

Sponsors—American Society for Testing Materials; Fire Protection Group; U. S. Department of Commerce, Bureau of Standards.

This standard, approved as American Tentative Standard in 1926 (A.S.T.M. C 19-26 T), is a revision of an earlier tentative standard adopted in 1919, and has remained unchanged since its approval. Consideration has been given to its provisions at regular intervals but the committee has found that a long period of trial is necessary to establish definitely the value of the requirements set forth in the standard. The committee has also taken the attitude that frequent revisions should be avoided, because of their effect on the status of classifications of building materials, which have been determined by tests conducted in accordance with the text of the present standard. The question of advancement of these methods for fire tests to the status of American Standard is now before the committee.

A.S.T.M. Committee C-5 on Fire Tests of Materials and Construction, with which the sectional committee actively cooperates, has made progress in several directions during the past year. One subcommittee is engaged in the preparation of methods for fire tests of doors for use in interior wall openings, and a second group has been investigating equipment and refinements in methods for testing of lumber. Results from the work of these subcommittees, when completed, will be available to the sectional committee.

A5-1930—Method of Test for Toughness of Rock

(*See A37*)

A6-1925—Specifications for Drain Tile

Sponsors—American Society for Testing Materials; U. S. Department of Agriculture.

This standard (A.S.T.M. C 4-24), originally adopted in 1922 as American Tentative Standard, was revised by the American Society for Testing Materials in 1924 and the revision was approved as American Standard in 1925. The need for further revisions to incorporate the results of research conducted since 1925 has been considered from time to time but, as there has been no general demand for adoption of changed requirements, action by the committee has been deferred. The sectional committee, which also functions as A.S.T.M. Committee C-6 on Drain Tile, is in close touch with other A.S.T.M. committees which have supervision over standards for clay and concrete pipe.

A13-1928—Scheme for Identification of Piping Systems

Sponsors—American Society of Mechanical Engineers; National Safety Council.

The Scheme for Identification of Piping Systems approved in 1928 by ASA as American Recommended Practice is still in force. Since its publication, the suggestion that a detailed system of identification for power-house piping be developed has been taken under consideration by the sectional committee.

A19-1923—Method of Test for Voids in Fine Aggregate for Concrete

Sponsor—American Society for Testing Materials.

The status of this project as given in the ASA BULLETIN (now INDUSTRIAL STANDARDIZATION) for March, 1932, page 103, has not been changed.

A21—Specifications for Cast-Iron Pipe and Special Castings

Sponsors—American Gas Association; American Society for Testing Materials; American Water Works Association; New England Water Works Association.

The experimental work which has been carried out during several years has been completed to the point where definite progress can be made by the several subcommittees.

Subcommittee 1-A on Barrel of Sand Cast Pipe has started the digest of the results of the water-pressure and trench-load tests and their correlation with the mathematical computation of pipe thickness to meet the loads of water pressure and water ram within, and earth and traffic loads without.

Subcommittee 1-B on Bells and Spigots, Lugs and Harnesses has completed deflection tests of pipe as affecting bell strength, and a test of a 36-inch harness for holding a bell and spigot joint subject to pull-out forces.

Subcommittee 1-C on Pipe Other than Pit Cast. A tentative draft of a Procedure for Test of Pipe Other than Pit Cast was completed and adopted by the Executive Committee. Work continued during the year on determining this program in detail for the various kinds, sizes, and thicknesses of pipe.

Subcommittee 1-D on Fittings. Following the tests on friction loss through fittings made for the committee at Cornell University, a study and report was made on the application of these results to the case of a typical water-distribution system. In addition, for this system, for both domestic and fire flows, determination of relative economy was made, including both cost of installation and capitalized cost of pumping for different kinds of fittings; namely, long fittings as given in the present water works standards, and short fittings being considered by this committee, and also between fittings with long radii of sweeps at the inside curvature. Additional information during the year has been in course of preparation on strength of fittings which, combined with the knowledge of friction loss, will be used in the preparation of new standards.

Work continued under Technical Committee 2 on Metallurgy, Processes, and Tests and Technical Committee 3 on Corrosion and Protective Coatings and their subcommittees without, however, reaching the stage of production of standards in addition to the Tentative Partial Specifications for Cement Mortar Lining for Cast-Iron Pipe and Fittings approved by the sectional committee in 1931.

A26-1930—Methods of Sampling Stone, Slag, Gravel, Sand and Stone Block for Use as Highway Materials

(*See A37*)

A27-1924—Method of Test for Apparent Specific Gravity of Coarse Aggregates

(*See A37*)

A31-1924—Specifications for Materials for Cement Grout Filler for Brick and Stone Block Pavements

Sponsor—American Society for Testing Materials.

No change has been made in the standard since the report in the ASA BULLETIN (now INDUSTRIAL STANDARDIZATION), March, 1932.

A35—Manhole Frames and Covers

Sponsors—American Society of Civil Engineers; Telephone Group.

A proposed American Standard covering 13 types of manhole frames and 7 types of manhole covers, as well as hydrant and service valve boxes was distributed by ASA in more than 6,000 sets of printed proof sheets, for general criticism and comment. The replies received (about 500) are under consideration by the sectional committee. For details of the proposed standard, see the ASA BULLETIN (now INDUSTRIAL STANDARDIZATION), January, 1932, page 44.

A36—Rating of Rivers

Sponsor—U. S. Geological Survey.

A comprehensive plan for the rating of power and rivers, including recommendations as to the units to be used, was completed by a representative sectional committee under the auspices of ASA in 1926. Submission for formal approval as an American Standard was, however, postponed in view of the importance of international cooperation. Numerous international interchanges have taken place, and the subject was discussed in conferences of the International Electrotechnical Commission in 1927 and again in 1930. Six definite recommendations adopted at the conference in 1930 are now being considered in the Central Office of the IEC. Following definite action in that office the recommendations will be considered by the sectional committee of ASA with a view to adoption as American Standard.

A37—Methods of Testing Road and Paving Materials

Sponsor—American Society for Testing Materials.

The sectional committee for this project was organized in 1926-27 with the A.S.T.M. as sponsor and is identical in personnel with the Society's Committee D-4 on Road and Paving Materials. The scope of the sectional committee, however, is limited to methods of testing road and paving materials.

Six standards are under the supervision of this sectional committee as follows: A37.1-1930—Method of Test for Penetration of Bituminous Materials (A.S.T.M. D 5-25); A37.2-1930—Method of Float Test for Bituminous Materials (A.S.T.M. D 139-27); A37.3-1930—Method of Test for the Determination of Bitumen (A.S.T.M. D 4-27); A5-1930—Method of Test for Toughness of Rock (A.S.T.M. D 3-18); A26-1930—Methods of Sampling Stone, Slag, Gravel, Sand, and Stone Block for Use as Highway Materials (A.S.T.M. D 75-22); and A27-1924—Method of Test for Apparent Specific Gravity of Coarse Aggregates (A.S.T.M. D 30-18). Of these standards, A5 originally received approval as American Tentative Standard in 1921, A26 and A27 in 1924. In 1929, A37.1, A37.2, and A37.3 were approved as American Tentative Standards. In 1930, after favorable action by the sectional committee and the sponsor, all of these standards except A27 were advanced to the status of American Standard.

At a meeting of the committee in Cleveland in March, 1932, consideration was given to submittal to ASA of A.S.T.M. Standard Method of Test for Distillation of Bituminous Materials Suitable for Road Treatment (D 20-30). Discussion indicated that certain sections of this standard were not satisfactory to all parties, however, so the question of submittal has been deferred pending possible revision.

In June, 1932, H. F. Clemmer, Engineering Department of the District of Columbia, Washington, D. C., succeeded P. J. Freeman as chairman of the sectional committee.

A38-1933—Steel Spiral Rods for Concrete Reinforcement

Sponsors—U. S. Department of Commerce, Bureau of Standards; Concrete Reinforcing Steel Institute.

In October, 1932, the joint sponsors for this project, the National Bureau of Standards and the Concrete Reinforcing Steel Institute, submitted a revision of this American Standard (A38-1927) (Simplified Practice Recommendation R53-26). The revised Simplified Practice Recommendation, now designated R53-32, had been accepted by the industry under the procedure of the Division of Simplified Practice during 1932. The revision was approved as American Standard on January 4, 1933.

In the revised document no changes have been made in the sizes of the reinforcing rods. However, the tabular form, in which certain data are presented, has been rearranged and other data formerly given in the body of the standard have been placed in tables in the appendix.

A40—Standardization of Plumbing Equipment

Sponsors—American Society of Mechanical Engineers; American Society of Sanitary Engineering.

Subcommittee 5, on Traps has completed its work on a proposed standard for brass lavatory and sink traps, brass traps, lead traps, vitreous china traps and interceptors, catch basins, and miscellaneous traps, including cast-iron traps. This draft is expected to be published for general criticism and comment.

Subcommittee 6, on Brass Plumbing Products has made progress, but no report is available at the present time.

Subcommittee 7, on Copper Water Tube Fittings, after giving consideration to the comments received after publication for general criticism and comment of the proposed standard for Brass Fittings for Flared Copper Tubes in February, 1931, has revised the draft. It is expected that the revised draft will soon be submitted to the sectional committee for approval.

Subcommittee 8, on Cast Iron Soil Pipe has completed a draft of a proposed standard which it is expected will soon be published for general criticism and comment.

A41—Recommended Practice for Brick Masonry

Autonomous Sectional Committee

During the past year there has been little change in the status of this project, which is summarized in the ASA BULLETIN (now INDUSTRIAL STANDARDIZATION) for March, 1932, page 107. Arrangements tentatively made by the Common Brick Manufacturers Association for editing sections of the proposed standard, which were prepared in 1930, have not been carried out. ASA records indicate that no recent meetings of the sectional committee have been held, nor are there before the committee definite plans for continuing this project.

A42—Specifications for Plastering

Sponsors—American Institute of Architects; American Society for Testing Materials.

During the past year the sponsors of this project have been giving careful consideration to the program of the sectional committee. F. Leo Smith, technical secretary of the American Institute of Architects, has assumed the chairmanship of the committee. It is proposed to hold a meeting within the next few months to give active attention to drafts for proposed specifications for lime plastering developed by a subcommittee under the chairmanship of J. A. Murray, Warner Company, Philadelphia.

A43-1930—Specifications for Putty

Sponsor—U. S. Department of Commerce, Federal Specifications Board.

The status of this standard, Federal Specifications Board No. 283, U. S. Government Master Specifications for Putty, which was approved as American Tentative Standard in 1930, is now under consideration by ASA. The original federal specification was superseded on April 15, 1931, by a new government specification for putty (Federal Standard Stock Catalog designation TT-P-791). The new specification, mandatory for all government departments and independent establishments, became effective on October 15, 1931. In the revised document, no changes have been made in the specifications for putty, but the form and style of the pamphlet were altered to comply with regulations of the Federal Standard Stock Catalog Board and changes were made in the methods of determining certain properties of putty.

Submittal to ASA of the present Federal Standard Specifications for Putty (TT-P-791) is under consideration by the Federal Specifications Board.

A44—Method of Test for Organic Impurities in Sands for Concrete

A45—Method of Test for Sieve Analysis of Aggregates for Concrete

Sponsor—American Society for Testing Materials.

These two projects cover A.S.T.M. standards of the same titles, designated as C 40-27 and C 41-24, respectively. Investigation, subsequent to their submittal in 1929, indicated that certain provisions of these standards were not acceptable to another cooperating body of ASA. In 1932, A.S.T.M. Committee C-9 on Concrete, which has jurisdiction over these two standards, recommended for publication tentative revisions that cover the sections to which objections have been entered. The Society has requested ASA to defer consideration of the approval of these standards until after the revisions are acted upon by the A.S.T.M.

A48-1932—Forms for Concrete Joist Construction Floors

This standard was submitted to ASA by the Concrete Reinforcing Steel Institute and the Bureau of Standards, jointly, and was approved by ASA as an American Standard. It covers the main dimensions of removable and permanent forms, pans, or domes made of wood, steel, or other material used in concrete ribbed floor construction, and is identical with the Simplified Practice Recommendation R 87-32.

Smith Acting Chairman on Committee on Plastering

F. Leo Smith, technical secretary of the American Institute of Architects, Washington, D. C., is Acting Chairman of the Sectional Committee on Specifications for Plastering (A42).

Classification of Coal Discussed Before Research Club

The classification of coal and the work of the sectional committee organized under ASA procedure were discussed at a meeting of the Pittsburgh Coal Research Club held at the Pittsburgh Experiment Station of the U. S. Bureau of Mines on February 6.

Dean E. A. Holbrook of the University of Pittsburgh, a member of the sectional committee, introduced the subject by indicating the need of coal classification and by outlining the steps leading to the formation of the sectional committee under ASA procedure.

The importance of the use of the microscope in determining the type of plant material composing coals was pointed out by Dr. R. Thiessen and P. Nicholls of the Pittsburgh Experiment Station of the U. S. Bureau of Mines; and the application of coal classification in the utilization of coal for heating purposes and the production of gas and coke was discussed by O. O. Malleis of the Koppers Research Corporation, Pittsburgh.

A. C. Fieldner, chief engineer, Experiments Station Division, U. S. Bureau of Mines, Washington, D. C., who is chairman of the sectional committee, H. J. Rose of the Kopper Research Corporation, Pittsburgh, and H. N. Eavenson, Pittsburgh, members of the committee, described the formation, organization, and objectives of the sectional committee and its technical subdivisions.

The tentative system of classification now under consideration by the technical committee on scientific classification, a subcommittee of the sectional committee, was presented and discussed by W. A. Selvig, Pittsburgh Experiment Station of the Bureau of Mines, a member of the subcommittee which prepared the tentative classification.

Safety Code for Paper and Pulp Mills Under Revision

A revised draft of the Safety Code for Paper and Pulp Mills (P1-1925) has been forwarded to members of the sectional committee for their consideration prior to the holding of a meeting of the committee within the next few weeks. This proposed revision is the first revision of the code since it was approved as an American Standard in 1925, and it is planned to incorporate many suggestions for improvement which have been submitted by the Paper and Pulp Mills Section of the National Safety Council, the sponsor for this safety code.

Spur Gear Tooth Form Standard Published

The new American Standard on Spur Gear Tooth Form (B6.1-1932) covering 14½-degree composite system, 14½-degree full depth involute system, 20-degree full depth involute system, and 20-degree stub involute system, has been published by the American Society of Mechanical Engineers and may be purchased at 45 cents per copy. The American Gear Manufacturers Association and the American Society of Mechanical Engineers are sponsors for the project. Copies of the standard may be obtained by ASA Members from the American Standards Association at 20 per cent discount.

Government Printing Office Adopts American Standard Symbols

The standard symbols and abbreviations approved by the American Standards Association during the past few years have been adopted by the Government Printing Office as reference standards for its Style Manual. These standards include the following:

Mathematical Symbols (Z10f-1928)
Letter Symbols for Electrical Quantities (Z10g1-1929)
Aeronautical Symbols (Z10e-1929)
Graphical Symbols for Telephone and Telegraph Use (Z10g6-1929)
Symbols for Hydraulics (Z10b-1929)
Symbols for Photometry and Illumination (Z10d-1930)
Symbols for Heat and Thermodynamics (Z10c-1931)
Symbols for Mechanics, Structural Engineering and Testing Materials (Z10a-1932)
Abbreviations for Scientific and Engineering Terms (Z10i-1932)

Standard for Shaft Couplings

The American Standard for Shaft Couplings, Integrally Forged Flange Type for Hydro-Electric Units (B49-1932), approval of which by ASA was announced in the February issue of INDUSTRIAL STANDARDIZATION, has been published by the American Society of Mechanical Engineers, sponsor for the project. The price of the standard is 35 cents, and copies are available from the A.S.M.E. or from the American Standards Association. Members of ASA may purchase the standard from the American Standards Association at 20 per cent discount.